Schaffers, V.
Le paratonnerre et ses progrès récents. Louvain. 1931. 87 p. 25 cm. (Extr.: Revue des ques. sci., t. 99 et 100. mai et juil. 1931.)
Sherlock, R. H., & Stout, M. B.
Annemometer for a study of wind gusts. [Menasha.] 1931. 38 p. illus. plate (fold.) 23 cm. (Engin. research bull., no. 20, May, 1931. Univ. Mich.)
Wagner, A.
Zur Aerologie des indischen Monsuns. Leipzig. 1931. p. 196–238. figs. 22 cm. (Sonderdr.: Gerlands Beitr. zur Geophys., Bd. 30 (1931).)
Wulf, Oliver R.
Determination of ozone by spectrobolometric measurements. Washington. 1931. 12 p. figs. plates. 24½ cm. (Smith. misc. coll., v. 85, no. 9.)

SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING DECEMBER, 1931

By HERBERT H. KIMBAL, in charge, solar radiation investigations

For a description of instruments and their exposures, the reader is referred to the January, 1931, REVIEW, page 41.

Table 1 shows that solar radiation intensities averaged above the normal values for December at Washington and Madison and close to normal at Lincoln.

Table 2 shows an excess in the total solar radiation received on a horizontal surface at Chicago, New York, and Miami as compared with the December normals for the respective stations; close to normal at Pittsburgh, and a deficit at Washington, Madison, Lincoln, Twin Falls, Fresno, Gainesville, and La Jolla. The last line in the table gives annual departures in percentages of annual totals.

Skylight polarization measurements made on 4 days at Washington give 61 for the mean percentage of polarization, with a maximum of 65 per cent on the 2d and 6th. At Madison, polarization measurements made on three days early in the month give a mean of 72 per cent with a maximum of 77 per cent on the 1st. These are above the corresponding averages for each station in December.

TABLE 1.—*Solar radiation intensities during December, 1931*

[Gram-calories per minute per square centimeter of normal surface]

Date	Sun's zenith distance									
	8a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Washington, D. C.											
Dec. 2	2.49	0.79	0.93	1.09	1.31			1.12	0.95	0.85	2.74
Dec. 7	3.15		1.00	1.18	1.36			1.12	0.86	0.75	2.26
Dec. 15	3.30	0.90	1.06	1.11	1.33			1.06	0.83	0.58	2.87
Dec. 16	3.81		0.97	1.13	1.38						2.74
Dec. 23	8.18	0.93									6.02
Means		0.87	0.99	1.13	1.34			1.10	0.88	0.73	
Departures		+0.08	+0.09	+0.06	+0.11			+0.06	−0.03	−0.06	
Madison, Wis.											
Dec. 1	2.49				1.42						1.96
Dec. 2	2.87			1.23							3.00
Dec. 3	3.30	0.95	1.04	1.18							3.15
Dec. 7	1.37			1.34				1.26			1.24
Dec. 14	2.36	1.10	1.15	1.10							2.26
Means		(1.02)	(1.10)	1.21	(1.42)			(1.26)			
Departures		+0.06	±0.00	±0.00	+0.07			+0.02			
Lincoln, Nebr.											
Dec. 1	2.36	1.05	1.13	1.29				1.23	1.09	0.88	3.30
Dec. 2	3.00			1.20				1.23	1.12	1.02	4.17
Dec. 11	6.50		0.99	1.19				1.25	1.11	1.00	3.81
Dec. 14	2.26	0.90	1.09	1.26				1.23	1.11		3.00
Dec. 15	2.62	0.79	1.04	1.10				1.21	1.07	1.05	3.30
Dec. 16	3.15	0.84	0.99	1.15				1.15	1.04		3.63
Means		0.90	1.05	1.20				1.22	1.09	0.99	
Departures		−0.04	−0.01	−0.02				+0.02	+0.02	+0.03	

[1] Extrapolated.

TABLE 2.—*Total solar radiation (direct + diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Week, beginning	Washington	Madison	Lincoln	Chicago	New York	Twin Falls	Pittsburgh	Gainesville	Fresno	La Jolla	Miami	Fairbanks
	Average daily totals											
1931	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Dec. 3	156	115	110	90	112	103	85	142	163	220	376	2.0
Dec. 10	133	113	156	112	85	163	78	187	170	250	367	1.5
Dec. 17	118	74	137	90	83	118	82	189	169	188	364	1.2
Dec. 24	137	66	87	64	160	101	65	204	122	202	274	1.7
	Departures from weekly normals											
Dec. 3	+8	−6	−55	+18	+22	−37	+5	−76	−14	−42	+73	
Dec. 10	−5	+1	−1	+40	−5	+37	+10	−22	+2	−10	+69	
Dec. 17	−22	−47	−33	+13	−12	−10	+15	−14	+8	−69	+86	
Dec. 24	−5	−58	−88	−16	+58	−51	−19	−36	−25	−36	−4	
	Departures from annual normals											
Gr. cal./cm.²	−1,750	+1,965	−445	+2,938	+2,893	−5,846	−1,420		+1,718			
Percentage	−1.4	+1.2	−0.3	+3.2	+3.1	−3.9			+1.1			

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, Superintendent United States Naval Observatory. Data furnished by Naval Observatory, in cooperation with Harvard, Yerkes, Perkins, and Mount Wilson observatories. The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column]

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1931	*h m*	°	°	°			
Dec. 1 (Mount Wilson)	13 50	+47.0	311.5	+13.0		9	
		+67.0	331.5	+10.0		137	146
Dec. 2 (Naval Observatory)	10 30	No spots					
Dec. 3 (Naval Observatory)	10 33	No spots					
Dec. 4 (Mount Wilson)	12 0	−63.0	162.9	+12.0		67	67
Dec. 5 (Naval Observatory)	10 35	No spots					
Dec. 6 (Naval Observatory)	10 23	−76.0	124.4	+12.0	31		31
Dec. 7 (Naval Observatory)	10 36	−54.0	133.1	+11.5		170	170
Dec. 8 (Naval Observatory)	12 47	−40.0	132.8	+11.5		278	278
Dec. 9 (Yerkes Observatory)	15 9	−28.5	129.9	+10.4	5		
		−27.7	130.7	+11.7		138	
		−27.7	130.7	+10.6	17		
		−27.6	130.8	+10.0	17		
		−26.1	132.3	+10.0	3		
		−25.2	133.2	+13.8	5		
		−25.1	133.3	+13.0	3		
		−25.1	133.3	+12.2		14	
		−22.8	135.6	+12.5	107		
		−21.6	136.8	+11.9	210		519
Dec. 10 (Naval Observatory)	10 17	−38.0	109.8	+4.0		62	
		−14.0	133.8	+11.0		340	402
Dec. 11 (Naval Observatory)	11 20	−23.0	111.0	+4.0		154	
		−1.0	133.0	+11.0		401	555
Dec. 12 (Yerkes Observatory)	14 18	−10.2	109.1	+4.3	7		
		−9.7	109.6	+5.3	5		
		−9.3	110.0	+4.1	2		
		−6.3	113.0	+4.3		48	
		−5.4	113.9	+4.7	22		
		+10.5	129.8	+10.2	88		
		+11.1	130.4	+11.0	2		
		+11.9	131.2	+11.2	2		
		+13.6	132.9	+11.7		169	
		+16.6	135.9	+12.2	37		
		+17.7	137.0	+12.4	37		419
Dec. 13 (Mount Wilson)	11 30	+4.0	111.6	+5.0		41	
		+26.0	133.6	+12.0		298	339

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic Diff. long.	Heliographic Longitude	Heliographic Latitude	Area Spot	Area Group	Total area for each day
1931	h m	°	°	°			
Dec. 14 (Naval Observatory)	12 43	+21.0	114.7	+4.0	15		
		+39.0	132.7	+12.6		278	293
Dec. 15 (Naval Observatory)	11 20	+33.0	114.3	+4.0	25		
		+50.0	131.3	+11.0		123	148
Dec. 16 (Naval Observatory)	10 30	+47.0	115.6	+4.0	15		
		+63.0	131.6	+11.0		93	108
Dec. 17 (Naval Observatory)	10 39	+78.0	133.4	+11.0		93	93
Dec. 18 (Naval Observatory)	11 36	−69.0	332.7	+11.0	93		93
Dec. 19 (Naval Observatory)	10 37	−56.0	333.0	+11.5	93		93
Dec. 20 (Naval Observatory)	10 48	−41.5	334.3	+11.0		46	46
Dec. 22 (Yerkes Observatory)	14 23	−12.6	334.9	+12.1	15		15
Dec. 23 (Naval Observatory)	10 37	−4.0	332.3	+11.0		31	
		+46.0	22.3	+14.0	31		62
Dec. 24 (Mount Wilson)	11 0	−80.0	242.9	−2.0		47	
		−80.0	242.9	−12.0	84		
		+5.0	327.9	+9.5		28	
		+59.5	22.4	+11.0		27	186
Dec. 25 (Yerkes Observatory)	13 26	−64.9	243.6	−13.4	284		
		−59.0	249.5	−2.5	19		303
Dec. 26 (Naval Observatory)	11 24	−54.0	242.4	−12.0	108		
		−47.0	249.4	−1.5	15		123
Dec. 27 (Naval Observatory)	14 10	−40.0	241.7	−14.0	139		139
Dec. 29 (Naval Observatory)	15 2	−13.0	241.9	−13.0		139	139
Dec. 30 (Naval Observatory)	12 49	−1.0	241.9	−13.0		139	139
Mean daily area for December							175

PROVISIONAL SUN-SPOT RELATIVE NUMBERS, FOR DECEMBER, 1931

(Data dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the coutresy of Prof. W. Brunner, University of Zurich, Switzerland]

December, 1931	Relative numbers	December, 1931	Relative numbers	December, 1931	Relative numbers
1	20	11	a 35	21	8
2	16	12	37	22	16
3	7?	13	a 38	23	17
4		14	37	24	d 23
5	0	15	26	25	31
6	Ec 7	16		26	31
7	12	17	15	27	31
8	13	18	8	28	15
9	24	19	8	29	9
10	Ec —	20	8	30	a 11
				31	9

Mean: 28 days=18.3.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group or spot through the central meridian.
c=New formation of a center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[The Aerological Division, W. R. GREGG, in charge]

By L. T. SAMUELS

Free-air temperatures were decidedly above normal and relative humidities were close to normal at all stations for December.

At the 1,000-meter level the resultant wind directions were close to normal at the northern stations but contained a considerably greater south component than normal at most of the southern stations. Resultant velocities were somewhat above normal at most stations.

At 3,000 meters the resultant directions were close to normal except at the extreme southern stations. At Key West a pronounced easterly component persisted to 4,000 meters as compared to the normal westerly direction at that level. Resultant velocities at 3,000 meters exceeded the normal appreciably in New England and at some southern stations.

TABLE 1.—*Mean free-air temperatures and humidities obtained by airplanes (or kites) during December, 1931*

TEMPERATURE (°C)

Altitude (meters) m. s. l.	Chicago, Ill.[1] (190 meters)	Cleveland, Ohio[1] (245 meters)	Dallas, Tex.[1] (149 meters)	Due West, S. C.[2] (217 meters)	Ellendale, N. Dak.[2] (444 meters)	Hampton Roads, Va.[2] (3 meters)	Omaha, Nebr.[1] (299 meters)	Pensacola, Fla.[2] (2 meters)	San Diego, Calif.[3] (9 meters)	Washington, D. C.[3] (2 meters)
Surface	1.7	2.3	7.2	9.1	−6.0	8.1	0.1	16.3	12.4	3.2
500	1.7	2.3	8.7	9.8	−5.4	7.2	0.7	15.8	10.8	4.6
1,000	1.3	1.5	8.6	9.9	−1.0	6.1	2.4	15.7	8.7	4.2
1,500	0.9	0.3	8.0	9.5	−0.1		3.0			
2,000	0.0	−0.8	6.7	7.9	−1.9	4.1	1.7	12.1	4.9	1.8
2,500	−1.7	−2.5	4.8	6.0	−4.3		−0.6			
3,000	−4.0	−4.8	2.6	3.4	−6.8	0.6	−3.1	7.0	0.9	−0.4
4,000	−9.4	−9.3	−3.9		−13.7		−9.5		−5.7	
5,000	−16.5	−14.6	−11.0		−19.7		−16.7		−13.6	
6,000			−16.2				−23.9			

RELATIVE HUMIDITY (PER CENT)

Surface	85	82	86	87	88	76	86	90	59	77
500	79	78	72	76	85	66	79	82	58	67
1,000	67	72	58	66	60	64	60	73	54	60
1,500	57	63	51	54	52		43			
2,000	49	56	45	53	56	41	37	63	40	46
2,500	45	50	42	42	56		36			
3,000	44	49	37	34	56	32	36	65	34	32
4,000	40	44	35		83		35		36	
5,000	30	39	36		65		32		60	
3,000			10				24			

[1] Airplanes (Weather Bureau). [2] Kites. [3] Airplanes (Navy).